

SUMMARY OF THE CLAIMS

Claim 1 (currently amended). A solid-state imaging device, comprising:

a semiconductor substrate;

a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;

a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge;

a single, continuous passivation section having a substantially flat top surface and a refractive index and overlying the light shielding section, the light reception section and the aperture; and

a planarization section overlying the substantially flat top surface of said passivation section, wherein the planarization section has a refractive index smaller than the refractive index of the passivation section.

Claim 2 (original). A solid-state imaging device according to claim 1, wherein the passivation section comprises at least a silicon nitride-based monolayer film.

Claim 3 (original). A solid-state imaging device according to claim 1, further comprising an insulation section having a substantially flat top surface which is interposed between the passivation section and the light shielding section.

Claim 4 (original). A solid-state imaging device according to claim 3, wherein the insulation section comprises at least a silicon oxide-based monolayer film.

Claim 5 (currently amended). A method for producing a solid-state imaging device, wherein the device comprises:

a semiconductor substrate;

a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;

a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge;

a single, continuous passivation section having a substantially flat top surface and overlying the light shielding section, the light reception section and the aperture; and

a planarization section overlying the substantially flat top surface of said passivation section, wherein the planarization section has a refractive index smaller than the refractive index of the passivation section, wherein the method comprises the steps of:

forming a single, continuous thin film used for forming the passivation section on the light shielding section and the aperture;

flattening a surface of the single, continuous thin film to form the passivation section by chemical machine polishing; and

forming a thin film used for forming the planarization section atop the substantially flat top surface of the passivation section; and

flattening a surface of the thin film used for forming the passivation section by chemical machine polishing.

Claim 6 (previously presented). A method for producing a solid-state imaging device, wherein the device comprises:

a semiconductor substrate;

a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;

a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge; and

a passivation section having a substantially flat top surface and overlying the light shielding section, the light reception section and the aperture so as to provide moisture and chemical resistance and to provide barrier properties against impurities, wherein the method comprises the steps of:

forming a thin film used for forming the passivation section on the light shielding section;

applying an SOG film to the thin film used for forming the passivation section; and

flattening a surface of the thin film to form the passivation section by performing an etchback technique under a condition that a selective ratio of the SOG film to the thin film used for forming the passivation section is about 1:1.

Claim 7 (currently amended). A method for producing a solid-state imaging device, wherein the device comprises:

a semiconductor substrate;

a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;

a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge;

a single, continuous passivation section having a substantially flat top surface and a reflective index and overlying the light shielding section, the light reception section and the aperture so as to provide moisture and chemical resistance and to provide barrier properties against impurities, and an insulation section having a substantially flat top surface which is interposed between the passivation section and the light shielding section; and

a planarization section overlying the substantially flat top surface of said passivation section, wherein the planarization section has a refractive index smaller than the refractive index of the passivation section, wherein the method comprises the steps of:

forming the insulation section on the light shielding section;

flattening a surface of the insulation section by chemical machine polishing;

forming the single, continuous passivation section so as to have the substantially flat top surface by depositing a material used for forming the passivation section on the insulation section; and

forming the planarization section by depositing a material used for forming the planarization section on the substantially flat top surface of the passivation section.

Claim 8 (currently amended). A method for producing a solid-state imaging device, wherein the device comprises:

- a semiconductor substrate;
- a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;
- a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge;
- a single, continuous passivation section having a substantially flat top surface and a reflective index and overlying the light shielding section, a light reception section and the aperture;
- a planarization section overlying the substantially flat top surface of said passivation section, wherein the planarization section has a refractive index smaller than the refractive index of the passivation section; and
- an insulation section having a substantially flat top surface which is interposed between the passivation section and the light shielding section so as to provide moisture and chemical resistance and to provide barrier properties against impurities, wherein the method comprises the steps of:
 - forming the insulation section so as to have the substantially flat top surface by applying an SOG film to the light shielding section and the aperture; and
 - forming the single, continuous passivation section so as to have the substantially flat top surface by depositing a material used for forming the single, continuous passivation section on the insulation section; and
 - forming the planarization section by depositing a material used for forming the ~~passivation~~ planarization section on the substantially flat top surface of the passivation section.

Claim 9 (original). A solid-state imaging device according to claim 1, wherein the passivation section comprises at least a SOG film.

Claim 10 (original). A solid-state imaging device according to claim 4, wherein the insulation section comprises at least a SOG film.

Claim 11 (original). A method according to claim 5, wherein the method further comprises the step of forming a SOG film to the passivation section.

Claim 12 (original). A method according to claim 7, wherein the method further comprises the step of forming a SOG film to the passivation section.

Claim 13 (currently amended). A solid-state imaging device, comprising:
a semiconductor substrate;
a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;
a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge; and
a single, continuous passivation section having a substantially flat top surface and overlying the light shielding section, the light reception section and the aperture so as to provide moisture and chemical resistance and to provide barrier properties against impurities and others.

Claim 14 (currently amended). A method for producing a solid-state imaging device, wherein the device comprises:
a semiconductor substrate;
a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor;
a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge; and
a single, continuous passivation section having a substantially flat top surface and overlying the light shielding section, the light reception section and the aperture so as to provide moisture and chemical resistance and to provide barrier properties against impurities and others, wherein the method comprises the steps of:
forming a single, continuous thin film used for forming the passivation section on the light shielding section and the aperture; and
flattening a surface of the single, continuous thin film to form the passivation section by chemical machine polishing.

Claim 15 (new). A solid-state imaging device, comprising:

- a semiconductor substrate;
 - a light shielding section having an aperture for partially shielding light incident on a surface of the semiconductor substrate;
 - a light reception section for converting the light which is incident on the surface of the semiconductor substrate through the aperture to an electric charge;
 - a passivation section having a substantially flat top surface and a refractive index and overlying the light shielding section, the light reception section and the aperture; and
 - a planarization section overlying the substantially flat top surface of said passivation section, wherein the planarization section has a refractive index smaller than the refractive index of the passivation section,
- wherein a selection ratio of the planarization section to the passivation section is about 1:1.

Claim 16 (new). A solid-state imaging device according to claim 15, wherein the passivation section comprises at least a silicon nitride-based monolayer film.

Claim 17 (new). A solid-state imaging device according to claim 15, further comprising an insulation section having a substantially flat top surface which is interposed between the passivation section and the light shielding section.

Claim 18 (new). A solid-state imaging device according to claim 17, wherein the insulation section comprises at least a silicon oxide-based monolayer film.

Claim 19 (new). A solid-state imaging device according to claim 15, wherein the passivation section comprises at least a SOG film.

Claim 20 (new). A solid-state imaging device according to claim 18, wherein the insulation section comprises at least a SOG film.